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Price differences between equity classes.
Corporate Control, Foreign Ownership or Liquidity?
Evidence from Norway.

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Abstract

Price differences between equities of different classes have long been of interest to financial economists. Price differences between voting and nonvoting equity have, for example, been used as evidence for the existence of private benefits of control. The main potential theoretical explanations for observed price differences are: value of control, foreign ownership restrictions and liquidity differences. In this paper we consider the case of Norway. The Norwegian case is instructive because of a natural experiment due to changes in regulation. In the Norwegian equity market there are significant price differences. The nature of the differences change over time. In the early part of the period nonvoting shares traded at a significant premium to voting shares, indicating that restrictions on foreign ownership were the most important determinant of observed price differences, dominating explanations based on voting power. As soon as restrictions on foreign ownership of Norwegian stocks were lifted, voting shares started trading at a premium to nonvoting.

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Price differences between equity classes. Corporate Control, Foreign ownership or Liquidity? Evidence from Norway.¹

Price differences between equities of different *classes* have long been of interest to financial economists. Traditional financial theory values a share of stock as the discounted value of its expected future dividends. Equity of different classes, which have equal claims to future dividends, but differ along some other dimension (voting power, accessibility for different types of investors), should with this logic have equal prices. However, when researchers empirically look at price differences across such classes this is not the case, there are substantial price differences.

The existence of these price differences has therefore lead to investigations of potential causes. There are three interesting theoretical issues. If there is a difference in the voting power of the equity classes, a higher price for the voting shares may represent private benefits of control. Secondly, if the equities trade in different markets, segmentation of the markets may explain price differences. Thirdly, price differences can be explained by any liquidity differences between the classes.

The Norwegian case is instructive because to some extent we can look at all these issues simultaneously. This arises because of a change in regulation that allows us to test for the relative importance of segmentation and corporate control explanations. Furthermore, the data for ownership proxies in Norway are very detailed.

In the Norwegian market there has been a significant change in the relation between different equity classes. In the early part of the period analyzed, non-voting shares were actually trading at a premium relative to voting shares. This relation is reversed for the later part of the period. The empirical results show that the fraction of a company owned by foreigners in the first part of the period was the most significant determinant for the price differences. The most likely explanation is that restrictions on foreign ownership in the early part of the period induced higher prices on equities available to foreigners. As soon as this restrictions was lifted, prices moved to reflect a positive “voting premium.” Consequently, the structural change in price differences seems to reflect changes in regulation.

The structure of the paper is as follows. In section 1 we discuss the various theoretical expla-

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nations of a price differential. Section 2 discusses the important institutional details and the data sources. Section 3 describes the evolution of the price differences. Section 4 performs several mixed panel data, time series regressions to determine which are the important variables influencing the observed price differences. Section 5 investigates short term correlations between price changes to further investigate the liquidity explanation. Section 6 concludes.

1 Potential explanations for price differences

Voting premium Let us first consider price differences for equities with different voting power. A number of theoretical papers have suggested the existence of private benefits to control. The main basis for these private benefits is the right of choice in a corporate control contest. But there are other sources of private benefits, for example the ability to influence the choice of board members. The classical theoretical studies of these issues are Grossman and Hart [1988] and Harris and Raviv [1988].

Important early empirical papers indicating the presence of these benefits are Lease et al. [1983] and Barclay and Holderness [1989]. Following these papers there has been quite a number of studies of prices of equity in classes with differential voting power in various equity markets around the world. Table 1 summarizes much of this research. As the table shows, in most equity markets

Table 1 The “voting premium” for selected equity markets.

The “voting premium” is calculated as: $((\text{price voting} - \text{price non-voting}) / \text{price voting})$. The premium is in some cases adjusted for partial voting rights.

Country	Source	Period	Average “voting premium”
Canada	Smith and Amoako-Adu [1995]	1981-86	7.8%
		1988-92	19.3%
Denmark	Bechmann and Raaballe [1998]	1986-96	2–30%
France	Muus [1998]	1986-96	51%
Italy	Zingales [1994]	1987-90	82%
Israel	Levy [1982]		45%
Switzerland	Horner [1988] Gardiol et al. [1997]	1978-83	24%
		1980-88	25%
		1989-92	5%
Sweden	Rydqvist [1996]	1983-90	12%
UK	Meggison [1990]	1955-82	13%
USA	Lease et al. [1983]	1940–78	5%
	DeAngelo and DeAngelo [1985]		

equities with superior voting power are trading at a premium. These types of results are often used as evidence for the presence of private benefits of control.

Market segmentation Distinct from theories based on benefits of control are theories based on *market segmentation*. This is an application of classical results that the same product can trade at different prices in physically separate markets. The application in this context comes from the possibility of separating buyers of equity. For example, if there are restrictions on the quantity of shares owned by foreigners of a domestic company, either for exogenous (regulation), or endogenous (company choice) reasons, these markets become separate, and prices may differ. This will happen when the marginal valuations of foreigners and domestic individuals differ.

There has been several studies of whether stocks available to foreign investors tend to be priced higher than the corresponding stocks available to domestic investors. As table 2 shows, this tend to be the case in all countries investigated.² In a recent investigation of related issues, Bailey et al.

Table 2 “Foreign premia” in selected stock markets.

The “foreign premium” is calculated as: (price equity available to foreigner investors-price equity only available to domestic investors)/price for equity only available to domestic investors)

Country	Source	Period	Average “foreign premium”
Finland	Hietala [1989]	1984-85	15–40%
Thailand	Bailey and Jagtiani [1994]	1988-92	5–20%
Mexico	Domowitz et al. [1997]	1990-93	4–10%
China	Chakravarty et al. [1998]	1994-96	–60%
Singapore	Bailey et al. [1999]	1988-96	32%

[1999] finds that the price differential for a sample of (mainly emerging) stock markets is related to the flow of funds in and out of the country, confirming the hypothesis that ownership segmentation is relevant.

Liquidity To the extent that there is differences in liquidity between these classes of stock, we may expect to see the more liquid classes demanding a premium. The empirical challenge is to find a relevant measure of liquidity.

²The sole exception being Mainland China. The authors of the study of the Chinese case suggests that there are significant informational differences between domestic and foreign investors in this market that may explain these results. China may also have a high political risk premium for foreign investors.

Empirical implications In terms of empirical implications of these theories, the corporate control explanation will predict a higher price for voting shares. The sign of any differences following the segmentation explanation is not obvious. If we are looking at the foreign/domestic distinction, the most likely prediction is that foreigners value Norwegian shares higher due to their diversification benefits. The liquidity explanation links liquidity differences with price differences, and this should be observable in the data.

2 Regulations and data

Regulations In this study we use data from the Oslo Stock Exchange (OSE) for the period 1989 till 1997. We have included all listed Norwegian firms with outstanding multiple classes of equity during the period.³

There are three equity classes of interest in the Norwegian market: A, B and F(free) shares. It is easiest to understand the differences by discussing two dimensions of differences, votes and foreign ownership. In terms of voting power, A and F shares have full voting power (one share—one vote),⁴ while B shares have no voting rights.⁵

Before 1995, the ability of foreign companies and individuals to own Norwegian shares was regulated. There was a maximal fraction (for the period before 1995 33%) of the company's voting shares that could be owned by foreigners.⁶ To simplify keeping track of foreign/domestic fractions, some companies split their voting shares into A shares and F shares. The fraction of F shares issued corresponded to the maximal percentage that could be owned by foreigners, and foreigners could then not buy A shares in these companies. The checking of the whether the "quota" of foreigners was filled thus became automatic. For companies that had *not* issued F shares, foreigners could buy up to the given percentage of A shares. It was in 1988 that companies were allowed to split the shares into A and F shares. At the beginning of 1995, the restriction on foreign ownership was removed as Norway considered membership of the European Union.

Throughout the period, there was no restrictions on foreign ownership of B (non-voting) shares. While nonvoting shares has been allowed in Norway a long time, it was in the late eighties that

³From the available companies we have excluded one company, Freia, because it was involved in a long, drawn out takeover battle. Table 10 in appendix A lists the companies used in the analysis.

⁴There may be limitations in the corporate charter.

⁵In cases of liquidation/mergers B share owners have some voting power.

⁶This maximal fraction could be increased by application to the Department of Industry. There were also additional regulation on the foreign ownership of financial institutions, as well as on companies with access to waterfalls.

companies started to issue nonvoting shares in significant amounts. A stated reason was a desire to attract foreign capital. In the period 1989 to 1997 between 28% and 50% of the market value on the OSE were in companies with restricted voting shares.

Data sources. The data used in the paper are from several sources. Equity prices, corporate events and accounting data is from the OSE data service.⁷ All listed equities traded at OSE are listed in a common Securities Registry.⁸ From this source complete year-end records of the ownership structure of all listed companies for the years 1989 to 1997 are available. For each owner we observe the number of shares owned and various details about the owner.⁹ This data allows us to calculate the fraction of the company held by foreigners, as well as measures of ownership concentration.

We also use estimates of the holdings of corporate insiders. These are taken from a database constructed at the Norwegian School of Management, where hand collected transactions and holdings for corporate insiders are used to construct measures of insider holdings.

3 Description of Price Differences.

In this section we summarize the evolution of price differences between the various classes for the period 1989 to 1997. Figure 1 shows averages of the *relative price differential* $(P_{A,it} - P_{B,it}) / P_{B,it}$ for all A and B shares, where $P_{A,it}$ is the price for an A share of company i at time t , and $P_{B,it}$ is the corresponding price for an B share. If there were no *systematic* differences between prices of A and B shares, this should average at zero. The annual averages of these relative price differences is also listed in table 3.

Figure 1 clearly shows that there has been a significant change in the relation between A and B shares. In the early part of the period the B (non-voting) shares were actually on average priced higher than the A (voting) shares. This clearly contradicts an explanation of the price differential based on the value of corporate control. This is most clearly seen in the value weighted average. Comparing this to the equally weighted average also tells us that it is the largest companies where the difference was largest. For the earlier period the more likely explanation is the distinction

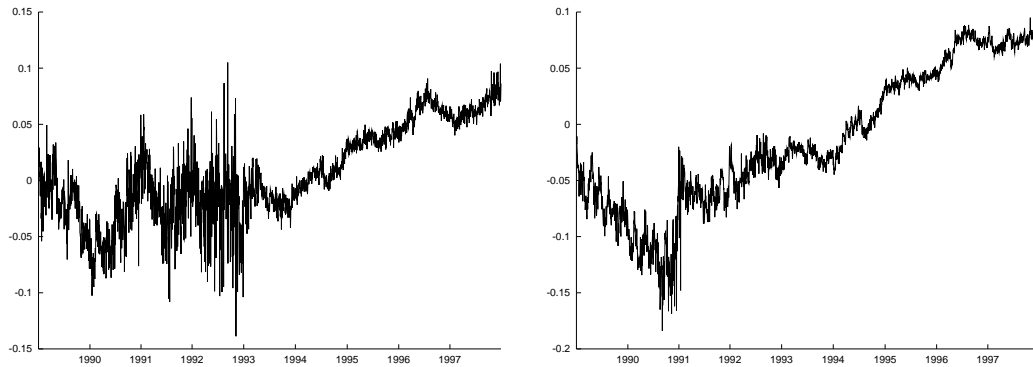
⁷ *Oslo Børs Informasjon* (OBI). Equity prices, shares outstanding and trading volumes are available on a daily basis.

⁸ *Verdipapirsentralen* (VPS).

⁹ We do not observe the name of the owner, only an anonymized id. For example we can observe the nationality of the owner, whether the owner is a listed company, a private individual, a listed corporation, a mutual fund etc.

Figure 1 Average relative price differential for A and B shares

Average relative price differential $((P_A - P_B)/P_B)$ for A and B shares. Data for companies traded on the Oslo Stock Exchange, excluding Freia. 1989–1997. On the left is an equally weighted average of all A and B shares trading at that day, on the right is a weighted average of the same prices, where the company market value is used to weight the observation. The figures only show observations on days when both classes were traded.



between domestic and foreign holders of shares. For the later part of the period, the relation between A and B shares has reversed. It is also interesting to note that the price differential has increased from about zero in 1995 to a 10% “voting premium” in 1998, and that this has happened steadily during the period. The one time change in 1995 will have problems explaining this. One possible explanation is that the gains from corporate control contests has increased in the Norwegian market. The number of mergers in recent years, both within Norway and cross border, may help explain this gradual increase.

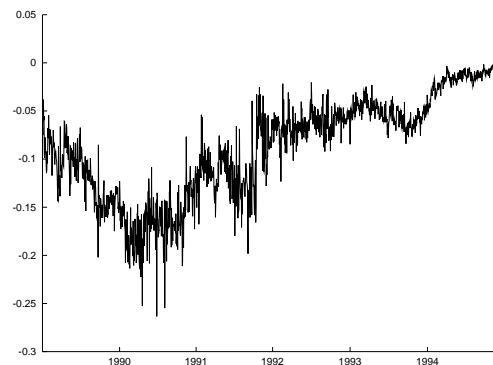
Another interesting observation is the significant change in the *volatility* of the price differential. This is easiest seen on the equally weighted average. The volatility clearly has gone down. This may reflect improved market efficiency, the reported prices being closer to their “true values”, and in general improved liquidity.

Figure 2 shows similar averages of the relative price differential between prices of A and F shares. The F shares, which has no ownership restrictions, are clearly higher priced than the A shares. Both shares have voting power, so we have to use either the distinction between foreign and domestic ownership or liquidity as explanatory factors for this price difference. It is reassuring to note that the price differential end up at zero at the end of 1994, since the F shares were changed into A shares on 1 January 1995.

It is also relevant to compare F and B share prices. Neither of these shares have ownership restrictions, and the difference between these may thus reflect the value of voting power. Figure 3

Figure 2 Average relative price differential for A and F shares.

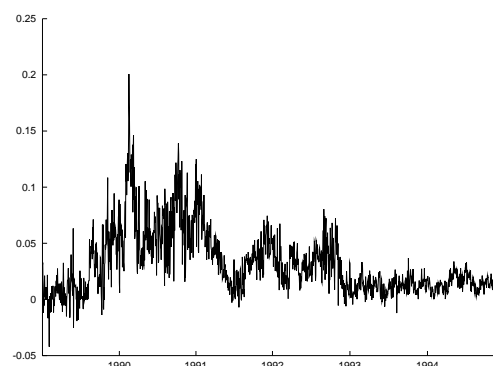
Average Relative Price Differential $((P_A - P_F)/P_F)$ for A and F shares. Companies on the Oslo Stock Exchange, 1989–1994. The figure only shows observations on days where both classes were traded.



shows daily averages of the relative price differential between prices of F and B shares. F shares clearly were more valuable than B shares, which may indicate that the “voting premium” may be present for Norwegian shares too, however it is not large enough to outweigh the effects of segmentation when looking at A and B shares.

Figure 3 Averages of the relative price differential for F and B shares.

Averages of the relative price differential $((P_F - P_B)/P_B)$ for F and B shares. The average only uses dates on which both security classes were traded. Data for all companies on the Oslo Stock Exchange, 1989–1994.



To summarize, there has been a significant change in the relation between different share classes in the Norwegian market in the period 1989 to 1997. The change is consistent with the explanation that when foreigners had restricted access to the Norwegian equity market, there was a premium on shares which were accessible to foreigners. In 1995, when this restriction was removed, the corporate control factor became more prominent, and voting shares started trading at a premium to non-voting shares. However, this is not the only possible explanation that will fit the data. It is

Table 3 Annual averages of the relative price differential.

Annual averages of daily relative price differentials. Numbers in percent. Data for all companies with multiple equity classes on the Oslo Stock exchange, excluding Freia.

	1990	1991	1992	1993	1994	1995	1996	1997
A/B equally weighted	-3.20	-0.96	-2.01	-1.28	0.48	3.67	6.13	6.44
A/B value weighted	-10.37	-5.75	-3.90	-3.30	-0.00	3.93	6.67	7.21
A/F equally weighted	-15.64	-11.22	-6.78	-7.43	-2.35			
A/F value weighted	-19.03	-11.75	-7.19	-6.22	-2.03			
F/B equally weighted	7.56	4.40	3.16	1.19	1.62			
F/B value weighted	5.70	3.57	2.51	0.92	1.55			

also possible that significant liquidity differences can generate these price differences.

4 Investigating the cause of the price difference

To investigate what explanation of price differentials fit the facts, we perform a mixed panel data, time series regression where we try to explain the observed relative price difference as a function of various *proxies* related to the three possible theoretical explanations discussed earlier.

Proxies For most of the proxies we only have access to annual data. As the dependent variable we therefore use the average of the premium during the year.¹⁰

As proxies for value of voting rights we use:

1. The fraction of total shares issued that has no voting rights (B shares). The higher this fraction, the easier it is to build up a voting majority.
2. As a measure of the ownership concentration we use a Herfindahl index of concentration.
3. The fraction of the company's stock owned by declared insiders.
4. The number of exchange-listed companies that were involved in mergers last year. This is a measure of the corporate control activity in the market, and may be related to the value of corporate control.

To investigate the foreign issue we consider.

1. The fraction of the company's voting shares held by international owners.

¹⁰This is not the only possible choice of dependent. We have also used averages for the last month of the year as the dependent variable in similar regressions. This does not change the results in any material way.

2. Since there was a change in the regulation of foreign ownership that took effect at the end of 1994, we add a dummy equal is one if the observation is prior to 1995 and 0 otherwise.

There is no obvious right proxy for the liquidity of a security. We perform regressions based on the following proxies:

1. Share turnover (Number of shares traded relative to number of shares issued).
2. The relative bid–ask spread. (Spread between bid and ask divided by current share price).
3. Number of days of the year that a security actually traded relative to the number of trading days in the year.

Depending on purpose, all these are sensible proxies for liquidity. The third will for example be most useful in distinguishing shares that are seldom traded.

Regression results Table 4 shows the results of regressing relative price differences of A and B shares on the different proxies. Because of the mixed panel data time series nature of the regressions, the standard errors are adjusted using GMM techniques.

Table 4 Explaining the price difference between A and B shares.

Regressions on relative price differences. Data for 1989 to 1997. Dependent variable $(P_A - P_B)/P_B$. Common explanatory variables (proxies) are: Fraction of issued shares that are non-voting (B) shares, a Herfindahl measure of ownership concentration, the number of mergers on the exchange previous year, fraction of company shares held by insiders, fraction of the company's voting shares held by foreigners and a dummy for whether the data is before 1995. The three regressions uses three different liquidity measures: Relative turnover, relative bid ask spreads and relative number of days in the year with actual trades. Estimated (GMM) standard errors in parenthesis.

Average	rel diff A/B 0.021		rel diff A/B 0.021		rel diff A/B 0.021	
Constant	0.098	(0.083)	0.099	(0.082)	0.092	(0.084)
Fraction nonvoting	-0.00065	(0.0016)	-0.00047	(0.0016)	-0.00071	(0.0016)
Herfindahl index	0.11	(0.15)	0.1	(0.15)	0.1	(0.16)
Fraction insiders	0.091	(0.046)	0.1	(0.045)	0.099	(0.048)
No merged last year	0.00077	(0.0012)	0.00063	(0.0012)	0.00067	(0.0012)
Fraction foreigners	-0.14	(0.13)	-0.14	(0.12)	-0.14	(0.12)
Indicator before 95	-0.087	(0.023)	-0.089	(0.02)	-0.088	(0.022)
Rel Turnover A/B	-0.017	(0.018)				
Rel bid ask spread A/B			-0.016	(0.038)		
Rel no trading days A/B					0.00016	(0.0019)
Number of observations	116		116		116	

The main observation to make from the regression reported in table 4 is that there clearly has been a significant change in the relation, since the dummy for whether the observation is before

or after 1 Jan 95 is highly significant. This is so regardless of the liquidity measure used. Given the significance of this indicator variable, we therefore split the period into two and concentrate on investigating the parameters for the two sub-periods.

Table 5 shows the results when splitting the data into sub-periods, before and after 1995. The

Table 5 Explaining the price difference between A and B shares, split in subperiods.

Regressions on relative price differences. Data for 1989 to 1997. Split into subperiods 1989–94 and 1995–97. Dependent variable $(P_A - P_B)/P_B$. Common explanatory variables (proxies) are: Fraction of issued shares that are non-voting (B) shares, a Herfindahl measure of ownership concentration, the number of mergers on the exchange previous year, the fraction of company equity held by insiders, and the fraction of the company's voting shares that are held by foreigners. The three regressions uses three different liquidity measures: Relative turnover, relative number of days in the year with actual trades and relative average bid ask spreads. Estimated (GMM) standard errors in parenthesis.

Period 1989–1994:

Average	rel diff A/B 0.011		rel diff A/B 0.011		rel diff A/B 0.011	
Constant	0.019	(0.049)	0.0045	(0.069)	0.011	(0.047)
Fraction nonvoting	0.00015	(0.0013)	-0.0002	(0.0016)	-4.4e-05	(0.0012)
Herfindahl index	0.053	(0.14)	0.056	(0.14)	0.062	(0.15)
Fraction Insiders	0.066	(0.052)	0.076	(0.058)	0.078	(0.056)
No merged last year	0.001	(0.0011)	0.0009	(0.0013)	0.00086	(0.0013)
Fraction foreigners	-0.3	(0.13)	-0.3	(0.15)	-0.3	(0.12)
Rel turnover A/B	-0.026	(0.016)				
Rel bid/ask spread			0.013	(0.042)		
Rel No trading days					-0.00078	(0.0017)
Number of observations	93		93		93	

Period 1995–1997:

Average	rel diff A/B 0.064		rel diff A/B 0.064		rel diff A/B 0.064	
Constant	-0.085	(0.09)	-0.02	(0.071)	-0.036	(0.069)
Fraction nonvoting	0.002	(0.0018)	0.0021	(0.0022)	0.0011	(0.0013)
Herfindahl index	0.55	(0.51)	0.55	(0.55)	0.65	(0.48)
Fraction Insiders	-0.038	(0.091)	-0.061	(0.099)	-0.069	(0.091)
No merged last year	-0.00067	(0.0027)	0.00058	(0.0027)	0.0011	(0.0029)
Fraction foreigners	0.1	(0.067)	0.11	(0.071)	0.13	(0.094)
Rel turnover A/B	0.076	(0.044)				
Rel bid/ask spread			-0.043	(0.074)		
Rel No trading days					-0.0046	(0.022)
Number of observations	23		23		23	

most striking finding of these regressions is the highly significant coefficient on the foreign ownership variable in the first sub-period. As theory predicts it is negative, the closer the ownership fraction is to the regulatory limit, the higher the premium foreigners are willing to pay to get B shares. In the second sub-period this coefficient has changed sign, and is no longer significant. While

the coefficients are not significant, it is interesting to note the consistently positive signs for the regression coefficients of “Herfindahl index.”

We next look at similar regressions on relative price differences of A and F shares. Since both these shares have voting power, differences must either be due to market segmentation or liquidity. Table 6 shows the results of this regression. Interestingly, in this regression several of the liquidity

Table 6 Explaining the price difference between A and F shares.

Regressions on relative price differences. Data for 1990 to 1994. Dependent variable $(P_A - P_F)/P_F$. Common explanatory variables (proxies) are: Fraction of issued shares that are non-voting (B) shares, a Herfindahl measure of ownership concentration, the number of mergers on the exchange previous year, the fraction of company equity held by insiders and the fraction of the company’s voting shares that are held by foreigners. The three regressions uses three different liquidity measures: Relative turnover, relative bid ask spreads and relative number of days in the year with actual trades. Estimated (GMM) standard errors in parenthesis.

Average	rel diff A/F -0.091		rel diff A/F -0.091		rel diff A/F -0.091	
Constant	-0.0031	(0.045)	-0.23	(0.063)	-0.0064	(0.053)
Fraction nonvoting	0.00036	(0.0014)	-0.00068	(0.0011)	-0.00021	(0.0019)
Herfindahl index	0.18	(0.42)	-0.085	(0.34)	0.02	(0.43)
Fraction insiders	-0.086	(0.042)	-0.12	(0.032)	-0.091	(0.043)
No merged last year	-0.0018	(0.00089)	6.5e-05	(0.00069)	-0.0023	(0.0012)
Fraction foreigners	-0.12	(0.16)	0.18	(0.16)	-0.22	(0.19)
Rel turnover A/F	-0.042	(0.016)				
Rel.bid ask spread A/F			0.22	(0.061)		
Rel.no trading days A/F					0.0021	(0.0018)
Number of observations	54		54		54	

proxies have significant coefficients. F shares did in fact tend to have significantly lower liquidity than A shares.

We finally look at similar regressions on relative price differences of F and B shares. This can be viewed as a better estimate of the pure “value of control,” since both these classes are available to foreigners. Table 7 shows the results of this regression. Unfortunately none of the coefficients show any sign of significance, but the signs are reasonable.

Was the foreign ownership that decisive? From the regressions above we see that foreign ownership seems very decisive. However, was it close to the 33% limit? As table 8 shows, it was not. The table shows (equally and value weighted) averages of the fraction foreigners owned of, respectively, the voting and all shares for the companies analyzed in this study. The average foreign fraction of voting shares is clearly not close to 33%. Therefore why do we see these huge price differences? One explanation of this may be that some of the shares were held by blockholders. This

Table 7 Explaining the price difference between F and B shares.

Regressions on relative price differences. Data for 1989 to 1994. Dependent variable $(P_F - P_B)/P_B$. Common explanatory variables (proxies) are: Fraction of issued shares that are non-voting (B) shares, a Herfindahl measure of ownership concentration, the number of mergers on the exchange previous year, the fraction of company equity held by insiders and the fraction of the company's voting shares that are held by foreigners. The three regressions uses three different liquidity measures: Relative turnover, relative average bid ask spreads and relative number of days in the year with actual trades. Estimated (GMM) standard errors in parenthesis.

Average	rel diff F/B 0.045		rel diff F/B 0.045		rel diff F/B 0.045	
Constant	0.038	(0.028)	0.03	(0.064)	0.041	(0.024)
Fraction nonvoting	-0.0031	(0.0017)	-0.0031	(0.0018)	-0.0032	(0.0021)
Herfindahl index	1.5	(1.1)	1.5	(1)	1.4	(1.3)
Fraction insiders	0.3	(0.26)	0.34	(0.41)	0.33	(0.27)
No merged last year	0.00088	(0.00058)	0.00084	(0.00075)	0.00075	(0.00069)
Fraction foreigners	-0.041	(0.12)	-0.046	(0.088)	-0.042	(0.11)
Rel turnover F/B	-0.0045	(0.0046)				
Rel.bid ask spread F/B			0.0097	(0.057)		
Rel.no trading days F/B					-0.0014	(0.017)
Number of observations	27		27		27	

would make the effective percentage available to foreigners less than 33%, and the segmentation “kick in” at lower percentages than 33%. It may also just be a reflection of a weighting of marginal benefits with marginal costs for foreign investors. To obtain a higher fraction of Norwegian equity they may have needed to pay an even higher premium, which may have been higher than the potential diversification benefits.

Table 8 Foreign ownership of Norwegian companies

The table list across company averages, both equally and value weighted, of respectively the percentage fraction of the voting shares owned by foreign investors, and the percentage fraction of all shares owned by foreign investors.

	1989	1990	1991	1992	1993	1994	1995	1996	1997
Average foreign fraction of voting shares	21	14	13	13	9.5	14	13	20	16
(value weighted)	22	16	18	19	17	20	25	31	26
Average foreign fraction of all shares	30	26	24	23	19	22	28	30	26
(value weighted)	28	26	27	30	27	30	34	35	36

5 A further look at liquidity

As the regressions above showed, liquidity proxies do not seem important. To confirm this, and further investigate how much of the price differential can be caused by liquidity, we look at high frequency data. If liquidity is such a serious problem that it may take several days to generate

“opposite” trades, we will discover this by looking at how prices adjust. With significant liquidity differences between equity classes, we would expect to find that correlations between price changes (returns) for the different equity classes are higher for *lagged* than for *contemporaneous* correlations. Table 9 show (averages of) contemporaneous and one lag correlations for daily and weekly returns. From the table we observe that the one period lagged correlation is much lower than the contem-

Table 9 Correlations of high frequency returns.

Across security averages of correlations of high frequency returns. Contemporaneous and one period lag correlations.

Data for all stocks listed at the Oslo Stock Exchange with multiple equity classes. 1989 to 1998.

Correlations of daily returns.

	B shares		
	$\rho(R_{At}, R_{Bt})$	$\rho(R_{At}, R_{Bt-1})$	$\rho(R_{At-1}, R_{Bt})$
Averages	0.48	0.09	0.09
	F shares		
	$\rho(R_{At}, R_{Ft})$	$\rho(R_{At}, R_{Ft-1})$	$\rho(R_{At-1}, R_{Ft})$
Averages	0.52	0.16	0.08
	Autocorrelations		
	$\rho(R_{At}, R_{At-1})$	$\rho(R_{Bt}, R_{Bt-1})$	$\rho(R_{Ft}, R_{Ft-1})$
Averages	-0.04	-0.08	-0.04

Correlations of weekly returns.

	B shares		
	$\rho(R_{At}, R_{Bt})$	$\rho(R_{At}, R_{Bt-1})$	$\rho(R_{At-1}, R_{Bt})$
Averages	0.66	0.05	0.03
	F shares		
	$\rho(R_{At}, R_{Ft})$	$\rho(R_{At}, R_{Ft-1})$	$\rho(R_{At-1}, R_{Ft})$
Averages	0.70	0.05	0.02
	Autocorrelations		
	$\rho(R_{At}, R_{At-1})$	$\rho(R_{Bt}, R_{Bt-1})$	$\rho(R_{Ft}, R_{Ft-1})$
Averages	-0.08	-0.09	-0.05

poraneous correlation. This makes liquidity differences a less likely explanation for the observed price differences. Interestingly enough, the lagged correlation between A shares and F shares is the highest. This was also the case where we did find liquidity had some explanatory power in the regressions in section 4.

6 Conclusion

We have investigated price differences between different equity classes in the Norwegian stock market. There has been a significant change in the relation between different share classes in the Norwegian equity market in the period 1989 to 1997.

The change is consistent with the explanation that when foreigners had restricted access to

the Norwegian equity market, there was a premium on shares accessible to foreigners. When this restriction was removed (in 1995), the corporate control factor became more prominent, and voting shares started trading at a premium to non-voting shares. This is confirmed by regressions showing that the percentage of the voting shares of a company held by foreign owners is the most important determinant of the price differential in the period before 1995, when foreign owners were prohibited from owning more than 33% of a company. Liquidity does not seem to be a large factor in explaining price differences.

Appendix

A Companies in the analysis.

Table 10 lists all the companies on the Oslo Stock Exchange with multiple share classes, and the time periods for which the various classes were listed.

Table 10 Companies used in the analysis.

The table lists the company name, the security classes, and the time periods for which we have price data and each security is listed. Dashes indicate that the stock was trading respectively before and after the sample period.

Company	Equity Class	Listing Period	
		From	To
Adelsten	A	1992	-
	B	1992	-
AF Gruppen	A	1997	-
	B	1997	-
Aker	A	-	-
	B	-	-
	F	-	1994
Awilco	A	-	-
	B	-	-
Bergesen	A	-	-
	B	-	-
Borgestad	A	-	-
	B	-	-
Christiania	A	-	1991
	F	-	1991
DNO	A	-	-
	B	-	1992
Mosvold Shipping	A	-	1997
	B	-	1997
Elkem	A	-	-
	F	-	1994
Fokus Bank	A	-	1991
	F	-	1991
Goodtech	A	-	-
	B	-	1992
Grand Hotel	A	-	1996
	F	-	1994
Hafslund Nycomed	A	-	-
	B	-	-
	F	-	1994
Havtor	A	-	1996
	B	-	1993
Kværner	A	-	-
	B	-	-
	F	-	1994
Nora Industrier	A	-	1991
	B	-	1991
	F	-	1991

Company	Equity Class	Listing Period	
		From	To
Norsk Data	A	-	1993
	B	-	1993
Norske Skog	A	-	1994
	B	-	-
	F	-	-
Nycomed	A	1996	1997
	B	1996	1997
Nycomed Amersham	A	1997	-
	B	1997	-
Nydalens compagnie	A	-	-
	B	1992	1994
Orkla	A	-	-
	B	-	-
	F	-	1994
Rieber & Søn	A	-	-
	B	-	-
Saga Petroleum	A	-	-
	B	-	-
	F	-	1994
Simrad	A	-	1996
	B	-	1996
Smedvig	A	-	-
	B	1996	-
Storebrand	A	-	-
	F	-	1994
Storli	A	-	-
	B	-	-
Søndenfeldske	A	-	-
	B	-	1993
Vard	A	-	-
	B	-	1992
Vital Forsikring	A	1991	1996
	F	1991	1994
Wilh. Wilhelmsen	A	-	-
	B	-	-

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